the tree of knowledge; and it was by like association with the devil that Faust secured the knowledge of renewed youth.

This view of science is not altogether unknown even in our own times. There are still heresy hunters who, with their own literal interpretation of Biblical writ, seek to extinguish the light of new knowledge. If Darwin and Huxley had lived in the time of Bruno and Galileo they would have suffered like penalties for presenting evidence of man's relationship to other primates. Leaders of the Church now accept the principles of organic evolution, just as there is now an observatory at the Vatican, and active astronomical observers among the brothers and fathers of Catholic priesthood. The truth is great and prevails in the end. Scientific inquiry never ceases and must continually be a disturbing influence. It is applied to all occurrences in which natural facts and phenomena are concerned, and believes nothing without evidence. Science does not set out to establish or depose any particular articles of faith, but to examine critically whatever comes before it in the natural world and to testify faithfully to what is seen. The knowledge thus gained may at times appear to undermine the foundations of faith, but in the course of years there is a readjustment of mental values, in which old errors are lost. From a scientific point of view, a distinction must be made between religion as an essential human instinct and outworn theological creeds or formulæ which assert that belief in unnatural occurrences is necessary for spiritual salvation. It is because of the influence of science that the Dean of St. Paul's can now say publicly, " the materialistic view of the resurrection has never been universally held; it was denied by Origen, the ablest theologian of the third century, and no intelligent man believes it now."

Examination of evidence in the critical spirit of scientific inquiry is responsible for the change of attitude towards scriptural records of natural events and phenomena represented in this remark of Dean Inge's. Only those who remember the contumely to which Huxley and Tyndall were exposed because of their extension of scientific reason to theological fields can appreciate the revolutionary change which has occurred since their day and generation. The great controversy between the evolutionists and the creationists in the second half of the nineteenth century corresponded closely with that between the Copernicans and Ptolemaists three hundred years earlier, and in each case belief had to give place eventually to ascertained knowledge. It is the duty of science to continue to fight ignorance and all that is implied by it, to be intolerant of all that is false, to make honest doubt a virtue, and condemn credulity as an intellectual crime. We may not be more superstitious than our fathers, but the vestiges of primitive man still remain in our natures ready to throw up offshoots under emotional stimulation. Much that passes under the name of spiritualism comes within this category, and when the manifestations enter the domain of matter and energy, the methods by which they must be investigated are those of physical science—critical observation, dispassionate examination of results, and crucial test of conclusions. These are the methods by which science has become synonymous with accurate knowledge, and has led the world into the way of truth. In the present epoch of social and spiritual reconstruction, the active ministry of scientific truth is again needed to help the world to adjust itself to the new conditions which knowledge has created.

Medieval Cartography.

Legendary Islands of the Atlantic: A Study in Medieval Geography. By William H. Babcock. (American Geographical Society, Research Series, No. 8.) Pp. v+196. (New York: American Geographical Society, 1922.) n.p.

THE migration of man across the ocean has differed considerably from his movement overland. On one hand, he has succeeded in taming animals by way of improving on the exertion of his own muscular effort, and in consequence he has perforce followed natural routes determined in part by a minimum of physical obstacles and a maximum or, at any rate, sufficient food supply for his animals, Moreover, through carelessness or accident he has dropped implements or weapons which give clues to the routes he followed and the sites of his settlements. On the other hand, the passage of the sea has called forth a different effort in the art of shipbuilding and seamanship, and the hungry ocean has swallowed up the remains of many a goodly ship which, through storm or adventure, passed over the trackless deep. Moreover, the wanderings of a people leave deeper marks on the historical record than the deeds of the men to whose individual prowess the opening of the sea-ways was largely due.

The author of " Legendary Islands of the Atlantic " attempts to sift legend from fact and vision from observation, in islands depicted on medieval maps of the North Atlantic, and to obtain thereby the links in the story of Atlantic exploration. Yarns of the western sea no doubt became the stock-in-trade of mariners and enabled cartographers to fill with shoals and islands the blank of the Sea of Darkness. Though more recent observations have shown that many of the islands do not exist as charted, the author establishes his reason for regarding them as indicative of early ocean voyages.

Europe and the North Atlantic are complementary, perhaps even supplementary, in their influence on the migration of peoples westward to populate a New World with the race stocks of the Old. Both the northern and southern seas emphasising the peninsular character of Europe are themselves the nurseries of boatmen, and with their special archipelagoes have invited and facilitated, from before the dim dawn of history, the maritime adventures which in succeeding ages led men to pass beyond the limits of the mainland to the oceanic islands, ever gazing towards the setting sun and wondering on the hidden mystery of the western horizon.

The physical form and phenomena of the ocean have not changed essentially since the dawn of history. Roughly circular in shape, the northern arc from the seas of north-west Europe to the entrance of the St. Lawrence is marked out by the island stations of the Shetlands, Faroes, Iceland, Greenland, Labrador, and Newfoundland. The southern arc swinging between the western coast of Africa with the island groups of Madeira, the Canaries and Cape Verde, and the eastern trend of South America with Trinidad and the Antilles, is emphasised in the intervening regions by prevailing Trades and equatorial currents.

It is therefore not surprising that reasonably accurate knowledge is shown of the various island groups that form the thresholds of the North Atlantic from the Mediterranean and the Northern Seas respectively. But within the central region of southern weed and northern storm and fog, and towards the west, casual, and it may be involuntary, voyages might be made. Here deceptive phenomena, begotten in part by unusual scenes and in part by fear and presentiment, or by stress and hunger, caused mythical and legendary islands to appear, with perhaps Rokel Rock or the Azores as nuclei, and produced enigmas for solution by later cartographical students.

We need not stay with Babcock's treatment of Atlantis. Few will disagree with his finding that every solution of the problem must be conjectural, and many will urge the same conclusions against the other islands upon which the author bases his arguments for the discovery of America in pre-Columbian times. Legendary islands, such as Brazil and Antillia, are not always located in the same regions of the Atlantic, but, like archæological remains, lie scattered over the map. It would have been extremely valuable if the author had plotted as accurately as possible on a modern map the various sites of some of these islands.

On many maps, of which the Catalan map of 1375 is a type, Brazil is shown as an annular island with numerous islets within. This, it is contended, represents the pear-shaped Gulf of St. Lawrence with its containing islands. Reference is made to the Sylvanus map of 1511 in support of this contention.

"Nobody doubts that it [the Sylvanus map] illustrates the St. Lawrence Gulf region, though there has been much speculation as to what unknown explorer has had his discoveries commemorated here, thirteen years before the first voyage of Cartier. Why should not a like episode of discovery and imperfect record have happened at a still earlier date?" (p. 65).

Antillia and its related islands as they appear on the Beccario Map (1435), the Pareto Map (1455), and others, are considered by Babcock to be the islands hitherto regarded as the special discovery of Columbus and his companions.

"There are two names still in common use for American regions which long ante-date Columbus, and most likely commemorate achievements of earlier explorers. They are Brazil and the Antilles. The former is earlier on the maps and records; but the case for Antillia as an American pre-Columbian map item is in some respects less complex and more obvious" (p. 144). "Surely some mariner had visited Cuba and some of its neighbours before 1435";
and again:

"We may be reasonably confident that Antillia of 1435 was really, as now, the Queen of the Antilles."

There is little record but the maps, and it is extremely difficult to determine whether these cartographical approximations are intelligent anticipations or based on experience. The Laurentian portolan (1351) with its broad sweep of Guinea and the distinctly non-Ptolemaic conception of South Africa, Schöner's globe (1515) with its Atlantic-Pacific passage, may with Brazil and Antillia fall into that voluminous class of verbal and cartographical descriptions from Homer until modern times which suggest that all recorded voyages and journeys are the outcome of innumerable "feelers," the experiences of the many upon which the triumphal entry of the discoverer is made.

The contention that these fourteenth- and fifteenth-century maps record adventures and voyages in western waters reopens in a new form the question of the trans-Atlantic voyages of Columbus and of Cabot, and it is to be regretted that Babcock merely mentions in passing the researches of Vignaud, and omits altogether the contention of Biggar for the second Cabot voyage.

The study of Greenland on the maps is somewhat inadequately dealt with, and students of these early maps would have welcomed a chapter on the relations and adjustment of the names of areas carrying such titles as Norbergia, Engronelant, Labrador, Bacallaos, etc., as shown on the Pilestrina map (1503–5) and others of a slightly later date.

The author deals with many other legendary islands, such as St. Brendan, Mayda, and Buss, the last two surviving until the opening of the nineteenth century, while the chapter on Markland reviews briefly the alleged discoveries of the Norse.

The book contains an excellent selection of reproductions and is welcomed as a contribution to the study of early cartographical efforts and their value in unfolding the story of geographical discovery.

W. H. Barker.

Pasteur's Scientific Career.

Pasteur and his Work. By L. Descour. Translated from the French by A. F. and Dr. B. H. Wedd. Pp. 256. (London: T. Fisher Unwin, Ltd., 1922.) 15*s*. net.

By the translation of this work Drs. A. F. and B. H. Wedd have made available to the English-speaking public one of the most complete accounts of the scientific career of Pasteur. Even the lay mind will be able to follow step by step and appreciate the series of brilliant researches which gave birth to the science of microbiology, culminating in that triumph of applied science—anti-rabies inoculation. Perhaps the very detail in virtue of which this book will appeal to those actively interested in science, will act as a deterrent to the general reading public. The first two chapters in particular, dealing with Pasteur's work on crystallography, require a degree of concentration likely to scare away all but the more determined. However, in a footnote we are told that these two chapters may be omitted without detracting in any way from the value of what is to follow. This is in fact correct, for these researches, although of great interest and of fundamental importance, serve mainly to show us that Pasteur, despite his unpromising years at school and the lycée, was possessed of a scientific mind which even at this early age bore the stamp of genius. They do not form a consecutive part of the brilliant investigations which follow and they can well be passed over.

The landmarks in the scientific career of this great man are familiar to most, and it would be out of place here to deal with them in any detail. Suffice it to say that in the first ten chapters or so we are given an account of his researches on fermentation, the question of spontaneous generation, putrefaction, aerobiosis and anaerobiosis. Here also an account is given of his study of diseases of wine and beer. Although perhaps less dazzling than his subsequent researches in the realms of animal pathology, this early work of Pasteur is the more interesting in virtue of its fundamental value. These are the foundations on which has been erected the edifice of microbiology. Without the knowledge gained by this work he would not have been able successfully to attack those future problems the solution of which obtained for him undying fame.

The remaining two-thirds of the book are concerned chiefly with his investigation of disease; diseases of silkworms, anthrax, furunculosis and puerperal septicæmia, chicken cholera, swine erysipelas, and finally rabies. Every one of these chapters is enthralling, but perhaps it is the study of chicken cholera which is of the greatest interest. Although his discoveries in this case did not lead to any practical application of great import, it was during these studies that a chance observation paved the way to protective inoculations. He had isolated the causal organism of this disease and shown that it was pathogenic for hens. Returning to his laboratory after vacation and wishing to continue his studies, he inoculated some hens with his cultures. To his surprise the birds remained perfectly well; his cultures had become avirulent. A fresh strain was isolated, and what was still more surprising, the hens which had received the avirulent culture were found now to be resistant to the new strain which control experiments showed to be virulent. Here was the starting-point of his work on virus vaccine and protective inoculation.

It is perhaps unavoidable that in a book of this nature one reads little of the man himself. However, one does catch a glimpse here and there. A man of great single-mindedness and power of concentration, he had a love of honesty which served him well throughout his work. His mind was of the well-ordered, clear, logical type which has characterised French science. These qualities bred in him a positive contempt for anything slipshod or ill-reasoned in experimental work, and when occasion called for criticism of work of this nature, Pasteur did so with a force and vehemence which showed little consideration for personal feelings. It was, however, nothing mean or little in his make-up which led him to do this, but merely anger at what he considered unpardonable blunders. He was not of those who suffer fools gladly. One is given an insight also into Pasteur's attitude to religion. Despite his success in the probing of nature's secrets, he retained unshaken to the end the faith given him by his parents. The following words taken from his speech on the occasion of his reception at the Académie Francaise reveal this side of Pasteur's character: "The greatness of human action is measured by the motives which inspire them. Happy are those who carry with them a God, an ideal of beauty which they obey: the ideal of art, the ideal of science, the ideal of country, the Gospel idea of virtue. Those are the living sources of